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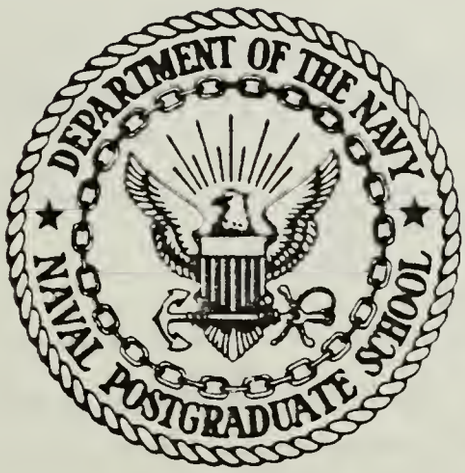

THESIS

AN ANALYSIS OF GOVERNMENT FURNISHED MATERIAL (GFM) IN NEW CONSTRUCTION SHIPS

by

Paul John Masters

December 1986

Thesis Advisor: Dan C. Boger

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An Analysis of Government Furnished Material (GFM) in New Construction Ships

by

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

This thesis discusses the supply support process for new construction ships, the feasibility, cost and impact of maximizing the use of the Navy supply system for repair parts and equipage, and provides regression models for use in program budget formulation and execution. The discussion includes the criteria for determining contractor versus government furnished equipment and material. The report also presents the results of a test case involving the transfer of parts procurement responsibility from the contractor to the government.

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I. INTRODUCTION

A. PURPOSE

This thesis has three goals. First, in a general sense, this project serves as a starting point for those individuals entering the outfitting community. The overview and in-depth descriptions will assist new arrivals to understand the overall support process. Second, the models can benefit all program managers in the formulation and execution of their program budgets. Third, research and discussion contained herein describe the feasibility, cost and impact of outfitting U.S. Navy ship's using the maximum possible Government Furnished Material (GFM).

B. BACKGROUND

Debate continues over the government's ability to provide outfitting material for new construction ships at a lower cost than can be otherwise provided. Currently, ship outfitting is a combination of Contractor Furnished Material (CFM) and Government Furnished Material (GFM).

This thesis tests the hypothesis that the government can outfit ships at a reduced cost if the Navy Supply System provides all parts. Continued research in this field is necessary to identify programs or innovations that can provide a cost/benefit advantage.

Outfitting new construction ships requires a large resource allocation by program managers. Most programs have seen an increased insurgence of subcontracting "clearinghouses" in the repair parts procurement process. Outfitting costs represent a significant investment and percentage of the total ship cost. The Navy must therefore weigh the alternatives of increasing the economies of scale within their supply system, conducting a repair parts break-out and contracting out the outfitting function, or preserving the status quo.

C. SCOPE

This study reports on research in all areas of outfitting new construction ships built by private shipbuilders. The project concentrates on the outfitting considerations of combatants built within the years 1985-86.

While other shipbuilding programs could be included, the selections are representative of a diverse cross-section of ship classes currently under contract. Each program carries varying degrees of contractor and government furnished materials.

This research deals strictly with new construction ships. Logistics and outfitting for modernization, reactivation, Ship Life Extension Program (SLEP), and overhaul ships are not addressed, though the conclusions and recommendations of this thesis may find some application in those areas.

This research will concentrate on the definition of direct material cost. Regression analysis of accumulated historical data presents various forecasting models for outfitting costs. These models apply to all size combatants exploiting the maximum amount of government furnished materials.

The author makes no attempt to measure contractor, sub-contractor, transportation, overhead, warehouse, labor or any other type of secondary costs.

D. METHODOLOGY

In attempting to achieve the aforementioned goals, Chapter II introduces the supply support process. Chapter III explicates the decision process with regard to how equipment and repair parts are divided into CFE/CFM and GFE/GFM. With data from Appendix B, regression models in Chapter IV provide forecasting capability to program managers whose programs utilize high percentages of GFM. Chapter V provides information on a test case, transferring certain material responsibilities from the contractor to the government. In Chapter VI, a discussion presents the impacts of increasing GFM for outfitting ships. Finally, Chapter VII presents the research conclusions and recommendations.

II. SUPPLY SUPPORT

Supply support is an iterative process that commences with end item identification and continues through retirement of the system or equipment. Since the entire process is dynamic, its iterative nature forces repetition with each new design change or improvement.

Supply support is the integrated product of 4 major stages: provisioning/configuration development, allowance preparation, outfitting/fitting out and operational review. While all these stages are necessary, the provisioning/configuration stage represents the foremost determinant of a platform's operational supportability.

A. PROVISIONING/CONFIGURATION DEVELOPMENT

Provisioning is the process of determining the range and quantity of spares and repair parts (such as modules, resistors, transformers, bearings, and switches) required to support and maintain equipments and components [Ref. 1:section 083a]. In addition, provisioning includes establishing data for catalogs, technical manuals, allowance lists, and preparation of instructions to ensure delivery of necessary support items with related end articles.

Provisioning and the entire supply support process form the basis for the actions necessary to ensure repair parts

support of operational fleet units [Ref. 2:pp. 1-3]. The hardware system's command maintenance philosophy, to a large degree, determines the appropriate repair part support for a particular end item. Three specific phases take place during the provisioning of a piece of equipment: [Ref. 3:pp. 3-1]

1. Submission of Provisioning Technical Documentation (PTD)

The PTD is documentation procured from the manufacturer of Government Furnished Equipment (GFE) or Contractor Furnished Equipment (CFE) for the purpose of identification and determination of on board repair part (OBRP) and wholesale system stock requirements [Ref. 1:section 083a]. MILSTD 1388 prescribes the format and preparation instructions for PTD by contractors. Individual contract PTD requirements will be specified in the Contract Data Requirement List. The type and amount of data provided to the appropriate Program Support Inventory Control Point will range from the number of shipboard installations to recommendations for supply system stock quantities. Drawings, technical manuals, and failure rate analysis are also included.

The NAVSEA Standard Provisioning Requirements Statement (PRS) integrates MILSTD 1552 with MILSTD 1561, which prescribes terms and conditions governing the provisioning of end items. The requirements of the Navy

Addendum set forth by SPCC and additional specific requirements are also included in the single NAVSEA document. This standard PRS applies to all current Naval Sea Systems Command acquisition contracts. [Ref. 4: pp. 1]

2. Engineering Review

a. Conventional PTD

When PTD is received by the Government, the Provisioning Activity (PA) conducts a review for engineering accuracy and technical adequacy. The PA must ensure that the provisioning parts list aligns itself with engineering drawings and agrees with the technical manual parts list. In addition, PTD drawings must be validated as adequate for technical coding decisions and to ensure that non-standard parts are sufficiently described for cataloging by the Inventory Control Point (ICP) [Ref. 5:pp. 44].

b. Logistic Support Analysis (LSA) PTD

The LSA is an engineering analysis undertaken during the acquisition process, as part of the system design process, to assist in achieving integrated support. Modifying the design is an option if support considerations dictate a change is necessary. Overall, LSA is an iterative process of analysis, trade-off, test, and evaluation. The objectives of LSA include: 1) influencing system reliability, maintainability, and configuration from a supportability standpoint and 2) determining support requirements for the system based on system design and

operational characteristics [Ref. 5:pp. 45]. One LSA objective includes reducing piece part support and increasing modular spare support. This is intended to minimize the manpower and skill requirements to maintain the system while increasing the operational availability of the system.

The Maintenance Plan is of paramount importance at this stage in the provisioning process. This tool guides the technician through the maze of technical decisions which must be made. The plan provides the logistics support direction necessary to project support requirements, while assigning authorized levels of repair. LSA and Level of Repair Analysis (LORA) form the basis for the maintenance plan data [Ref. 2:pp. 1-25].

c. Weapons System File (WSF) Load

The WSF is the authorized configuration data base for the Navy. As such, it provides the capability to decision makers to perform their maintenance, provisioning, allowance, and program support responsibilities. This management file contains records for all Navy platforms, Security Assistance Programs, and selected shore activities. The WSF contains two principal classes of data regarding the supply support stages of provisioning/configuration development and allowance preparation:

(1) WSF Level "A". This level contains the configuration data base for all ships. In more familiar terms it matches an individual ship with indentified quantities of installed equipments. Allowance Parts Lists (APL's) and Allowance Equipage Lists (AEL's) form the bridge between the equipment, related parts, and ships within the file. The integrity of this file ultimately determines piece part support at the shipboard level, and therefore its development requires maximum management attention throughout the development process. Level A is established and maintained by the Ship Equipment Configuration Accounting System (SECAS), Preliminary Equipment Component Index (PECI), and Fitting Out Management Information System (FOMIS). PECI and FOMIS are discussed below under configuration development since it is through these two avenues that configuration data enter the WSF Level "A" for new construction ships.

(2) WSF Level "C". This level of the WSF contains piece parts information for APL's/AEL's. The provisioning process establishes and maintains the WSF Level C. In addition to definitizing repair parts (NSN, NICN) to APL's/AEL's, Level C contains information regarding Next Higher/Lower Assemblies (NHA/NLA), equipment nomenclature, and technical manual numbers.

The author feels it is imperative that the reader remember that the quality of the WSF file, as it

relates to supply support, remains a function of the completeness of PTD received, the engineering decisions of the individual provisioner, and ultimately, the integrity of the platform's configuration data base resident in the WSF Level A.

3. Configuration Development

Whereas the integrity of the WSF Level C depends on accurate provisioning and file loading, the basis of shipboard supply support rests with the validation of installed equipments onboard the platform and proper identification and transmission of that information to the WSF Level A. The Fitting Out Management Information System (FOMIS) and Preliminary Equipment Component Index (PECI) are two methods that accomplish the latter task for new construction ships.

a. FOMIS

FOMIS is a Naval Sea Systems Command-owned, integrated management system, operated by the Ships Parts Control Center (SPCC). This automated system is essentially a three-fold system: 1) a configuration status accounting system, 2) a management-by-exception oriented information system, and 3) a centralized data base for the collection and accumulation of Integrated Logistics Support (ILS) data.

FOMIS interfaces with WSF Level A. To reiterate, the WSF Level A is the Navy's primary ship equipment/component and equipage list configuration record.

FOMIS is the vehicle which provides specific configuration data to Level A for a given platform [Ref. 6:pp. 2-15-01].

This system provides a means to accurately define a ship's configuration and evaluate its progress towards achieving supply readiness objectives. FOMIS monitors and displays the progress and status of contractor furnished equipment, government furnished equipment, and equipage at the APL/AEL level. FOMIS records are established for each installed equipment/component and equipage list. Records are incrementally opened, then updated with specific provisioning documentation, equipment/component receipt, installation and validation data. In essence, FOMIS contains a broad scope of information built incrementally throughout the platform's construction period. [Ref. 6:pp. 2-15-02]

Upon ship delivery plus approximately 10-12 months, configuration management will transition from FOMIS to the Ship Equipment Configuration Accounting System (SECAS) master files. Here it will be maintained current for use in ship planning and logistics support programs during the operational phase of the platform's life cycle. [Ref. 7:pp. 0-3]

For future contracts, the Real Time Outfitting Management Information System (ROMIS) may be used. The SSN-21 program will use ROMIS.

b. Preliminary Equipment/Component Index (PECI)

The PECI record is a working file which contains prescribed technical data of equipments, components, and equipage groupings installed or applicable to a given platform. The ICP develops and maintains this file from program data supplied by the hardware systems commands or the Naval Supervising Activity (NSA), generally the Supervisor of Shipbuilding (SUPSHIP) for new construction ships. [Ref. 7:pp. 4-1]

Unlike FOMIS, PECI uses a more manually driven input process. Reports of adds, deletes, or changes of the PECI to the ICP can be accomplished using NAVSUP Form 1174 or magnetic tape. Once validated, information is loaded into WSF Level A. The ICP returns incomplete inputs to the NSA for correction.

4. Validation

Accurate and timely validation of a ship's onboard equipment is critical in the development of shipboard allowance lists. Validation is the process of assuring that the onboard installed equipment/components/equipage and population correspond to the information provided to the WSF Level A. Sight validation is the physical identification process. Sample validation, or commonly called paper validation, involves the review of technical drawings and blueprints. No enhancements to the Coordinated Shipboard Allowance List (COSAL) will improve supply support afloat

without a corresponding program to ensure that the installed equipments, configuration data base, WSF Level A, and the COSAL are all in agreement.

B. ALLOWANCE PREPARATION

1. Coordinated Shipboard Allowance List (COSAL)

The COSAL represents the primary authorization document, establishing material support for installed and portable equipment and providing a listing of the equipage required for a ship to perform its operational mission [Ref. 8:pp. 2]. The allowances defined within the COSAL are mandatory requirements for inventory range and depth.

The COSAL is both a technical and supply document. It is technical in that it provides a description of nomenclature, operating characteristics, and technical manuals directly on the AFL/AEL. It is a supply document in that it cites repair parts, allowance quantities, and provides a number of cross-reference lists to permit identification of National Stock Numbers (NSN). In short, the COSAL provides the capability to the technician/supply personnel to cross-reference a part number from a technical manual to a stock number recognized by the supply system and verify that the part belongs to a particular equipment/component on that ship.

2. COSAL Preparation

The basis for allowance list development is the information compiled during the provisioning/configuration

stage and other information resident within the Weapons System File. The Navy uses various methods of building COSAL's. The two methods typifying current trends include 1) conventional and 2) Modified Fleet Logistic Support Improvement Program (MOD-FLSIP). The conventional model computes allowances based on Allowance Factor Codes (AFC's) and other special computational routines for Hull, Mechanical and Electrical (HM&E) equipments in Fleet Ballistic Missile (FBM) submarines [Ref. 3:pp. 3-3]. The MOD-FLSIP on the other hand, is rapidly becoming the most common allowance methodology. Based upon the .25 FLSIP method which qualifies items with expected annual usage greater than 1 in four years, MOD-FLSIP qualifies items for stock if the expected annual usage is greater than 1 in ten years for critical items. The three main factors considered in determining whether an item should be stocked or carried onboard include: matching the ship's maintenance capability level to the third digit of the source, maintenance and recoverability code (SM&R); the best replacement factor (BRF); and the installed population. To qualify for stocking, the ship must first be capable of removing and installing the part. Additionally, if the BRF and installed population of the item indicate an expected demand of equal to or greater than one unit in ten years for critical items, it will be stocked. Planned maintenance and safety requirements identified and coded in the provisioning stage

automatically compute for allowance through Technical Override (TOR) codes.

The COSAL is voluminous and intimidating and can be a tremendous asset or a source of many frustrating experiences. The author strongly recommends a review of the COSAL Introduction provided at the beginning of each COSAL in addition to the COSAL Use and Maintenance Manual (SPCCINST. 4441.170) as a means of breaking the communication barrier between the document and the user.

3. Incremental Stock Number Sequence List (ISNSL)

The objective of the ISNSL program is to facilitate the efficient procurement of government and contractor furnished material. This is accomplished by providing a computed allowance based on the ship's configuration at specified times during the construction cycle.

The program incrementally computes allowances. This advises both the shipbuilder and the government of the range and depth of parts required to support a given ship configuration at varying points during the construction period. [Ref. 3:pp. 3-4]

In addition to producing statistics, the program also permits timephasing the entire outfitting/fitting out function. It also provides for funding stability through the anticipated procurement of all allowance requirements.

C. OUTFITTING/FITTING OUT

The outfitting stage commences at the time material requirements are identified. This occurs with the production of the first Incremental Stock Number Sequence List (ISNSL) during the allowance preparation stage. Appropriate funding is then provided through the contract for Contractor Furnished Material (CFM) or the Outfit Supply Activity (OSA) for Government Furnished Material (GFM). Material procurement then takes place and its status is monitored until receipt and inspection at the outfitting site is completed. At this point pre-staging of material in mock-up bins and locations takes place.

While the contractor procures the CFM requirements of the ISNSL, an Outfit Supply Activity is the naval activity designated by the Commander, Naval Supply Systems Command to procure all GFM specified in allowance lists. In addition to material allowances designated in the allowance preparation stage listed above, a General Use Consumables List (GUCL) is developed to provide an initial supply of consumables to the ship for use upon commissioning. Although the NSA is responsible to the SHAPM for outfitting the entire ship, the OSA provides assistance by 1) introducing all Government Furnished requisitions for new construction ship allowances into the supply system, 2) controlling and accounting for SCN outfitting funds, 3) providing requisition and material status for all items

through the COSAL Requisitioning and Status Procedures (CRASP), and 4) expediting requirements as necessary.

The CRASP system discussed above represents a major program in government furnished material outfitting. This program supports two major facets of the outfitting process: supply management and material management. Supply management refers to the procurement of material from the supply system. Material management provides for an accounting of the material from the moment it is received from the supply system to the time it is turned over to the end user. Material management has been phased down over the past few years with emphasis on free-flowing material to the fitting out site. This reduces the holding costs and second destination transportation charges associated with accumulating material at a staging warehouse prior to forwarding it on to the shipbuilding site.

1. Fitting Out

The author defines fitting out as a subsystem of outfitting. Fitting out is the operation of placing all allowance list material on board ship. The end product of fitting out is material, specified in the authorized allowance lists, stowed in its proper location in the ship with standard documentation for locating the items [Ref. 9:pp. 1]. Equally important is the fact that at this time the commissioning crew assumes responsibility and accountability of the material.

2. Goals for Material Outfitting/Fitting Out

Overall, new construction ships are required to meet 97% of total allowance requirements at delivery [Ref. 10: encl 1]. While undefined, it is currently expected that 90% will actually be loaded onboard at delivery, with the remaining material to be loaded prior to sailaway.

The contractor will strive for 100% availability of all CFM in the loading COSAL, plus any additional material identified in the Allowance Appendix Package (AAP) prior to the scheduled date for fitting out. It is noteworthy that any deviation greater than 5% in CFM allowance item availability (range and depth) for the lead ship, and 3% for follow ships at the time of the official shortage list, will be considered inadequate performance under the terms of the contract. [Ref. 1: section 083f]

Contractor binning accuracy will meet or exceed 98% based upon a sample validation held prior to ship delivery. [Ref. 10: encl 1]

3. Integrated COSAL (I-COSAL), Integrated Allowance Document (IAD)

Upon completion of fitting out, delivery and commissioning, the ship will be provided an I-COSAL or an IAD. While the names are different, they both integrate the Allowance Appendix Package with the loading COSAL. The purpose of this document is to provide the ship with a single complete allowance document which includes support

for the entire ship's configuration [Ref. 4:pp. II-22]. SPCC produces the I-COSAL. Civilian contractors or the shipbuilder generally produce the IAD. Which document the ship will receive depends upon the SHAPM's acquisition strategy and contractual requirements.

D. OPERATIONAL REVIEW

Supply support is a dynamic process. Changeouts at the equipment/component level, changes in the engineering design of a provisioned piece of equipment referred to as Engineering Change Proposal's (ECP's), and demand usage are just a few of the facets within the support framework which dictate change. These changes occur through a reiteration of the provisioning/configuration development, allowance preparation, and outfitting/fitting out stages. Change is a way of life throughout the supply support process, and as stated at the beginning of the chapter, this process will continue through the entire life cycle of the ship.

III. EQUIPMENT AND MATERIAL SUPPLY DETERMINATION

The method for procuring new construction ship equipment and material is determined very early in the program's life. Essentially two ways exist to procure equipment. The Program Manager (PM) can use either the Contractor Furnished Equipment (CFE) approach or the Government Furnished Equipment (GFE) method to accomplish this task.

The term CFE applies to designated equipment that the contractor must provide, either manufacturing it himself or procuring it from a third party. The term GFE applies to designated equipment or components that the government provides to the contractor for installation in the end item delivered. [Ref. 4: pp. 16]

A. GENERAL POLICY (CFE/GFE)

Contractors will ordinarily furnish all equipment for performing government contracts. Program managers should provide equipment to a contractor only when necessary to achieve significant economy, standardization, expedited production, or when it is otherwise in the government's interest to do so. [Ref. 11:section 45.303-1]

If the government determines that it is in their best interest to provide equipment as (GFE), the contractor becomes directly responsible and accountable for all

equipment delivered to him in accordance with the contract [Ref. 11:section 45.502].

The decision regarding CFE/GFE can be altered during the construction process. The contract may be bilaterally modified to provide for changes, provided there is adequate consideration for such a modification. Unilateral decreases in, or substitutions for the GFE specified under the contract may be ordered by the contracting officer. These changes are subject to an equitable adjustment of the contract. [Ref. 12:section 13-203]

While the above policy appears to favor contractor efforts in equipment procurement, DOD nevertheless requires the screening of DOD inventories for assets which could be utilized to fill the need. When economic analysis shows that system assets are more cost-effective, they will be used. [Ref. 13:pp. 2]

B. GFE/GFM POLICY

The general policy provides for the contractor to ordinarily procure equipment to meet contract requirements. The following cases are examples where it may be in the best interest of the government to provide or specify equipment or material. [Ref. 14:pp. 1]

1. Economical Buys

If significant savings will accrue from quantity buys, equipment and material should be government furnished.

2. Developmental

This category includes equipment in a research and development status with no prior naval shipboard operational experience or definitive specifications. This type of material shall be specified only when the requirement cannot be satisfied by existing equipment.

3. Complex Materials

The government must maintain surveillance over the procurement and manufacture of some equipments. This includes such technological advances which go beyond the state of the art of the shipbuilding industry.

4. Long Lead Time Items

Production lead times for certain equipments may require procurement in advance of the contract award to ensure delivery of the end item on a reasonable schedule. Prior to establishing these items as GFM, the Program Manager should review techniques which can transfer a GFM prime contract to the shipbuilder as part of the contract award.

5. Government Stock in Long Supply

Required equipment or material will be considered as GFE if it is available in DOD stock and is in long supply. The equipment must meet specification requirements, provide real cost savings and clearly outweigh the government's obligations with respect to GFE. Government obligations with respect to GFE will be outlined later in this chapter.

6. Outfitting Material

This segment includes standard stock items (GFM) not requiring installation by the shipbuilder. The government furnished portion of the ISNSL and COSAL process (GFM) is a direct result of the list of GFE contained in the contract. This contract GFE is also called Schedule A equipment.

7. Standardization

The NAVSEA policy regarding standardization includes minimizing size, type and varieties of equipment and ship systems. The objective of standardization is to achieve life-cycle-cost savings by enhancing interchangeability, reliability, maintainability and logistic support. In some cases, standardization can be optimized through GFE or by specifying certain equipment or components to shipbuilders.

Equipment and material should not be made GFE/GFM for the sole purpose of achieving standardization. Normally, weapon system equipment, electronic equipment and complex Hull, Mechanical and Electrical (HM&E) systems or equipment are the best candidates for GFE/GFM.

8. Security

Items under the cognizance of the Naval Security Group Command Headquarters must be GFM.

C. GOVERNMENT OBLIGATIONS IN PROVIDING GFE/GFM

The Program Manager assumes extensive contractual obligation on behalf of the Navy when he decides to provide

equipment and material to the shipbuilder for use in constructing a ship. This is especially true with regard to GFE, since most equipment must be installed within a specific time frame during the construction period.

The government obligation normally includes 1) proper identification of material and technical documentation, 2) a warranty that the material and technical documentation is suitable and deliverable by the time set forth in the contract schedule, 3) delivery of the material and documentation to avoid delay and disruption claims, and 4) furnishing material which conforms to the total ship system requirements as detailed in the ship specifications and drawings. [Ref. 14:pp. 1]

While establishing contractual obligations for the Navy, the Program Manager must also deal with a matrix organization. He must ensure that both the contract obligations are met and schedule slippage and delays do not occur due to late delivery or cancellation of GFE requirements. The control of the PM's GFE requirements lay in the hands of Participating Managers (PARM's). The PARM's have the responsibility to procure, divert, or requisition GFE for the PM. The Ship Planning Document (SPD) issued by the PM details the PARM's responsibilities for that shipbuilding program. In addition, it establishes the PM's desires with regard to which equipments he will provide to the contractor as GFE. In some instances, the SPD will also

dictate the procurement of On Board Repair Parts (OBRP) to support the equipment.

The PARM's are primarily responsible to their functional head and not the PM. Because of this, some Ship Acquisition Project Managers (SHAPM) feel that they lose direct program control by providing equipment and material as GFE/GFM through the PARM. The SHAPMs are ultimately responsible and accountable for the successful implementation of their programs [Ref. 15:pp. 3]. In most cases the PM receives much better response to his needs from the shipbuilder than can be achieved from within the matrix [Refs. 16,17,18].

D. CURRENT NAVAL SEA SYSTEMS COMMAND (NAVSEA) POLICY

Today's Program Manager faces a dynamic environment. No two programs are alike; no two weapons system's/platform's are the same. All equipment decisions must be based on their individual merits. This includes a thorough, timely analysis of the cost/benefit trade-off's on each case, evaluated within the context of the program's objectives and acquisition strategy. [Ref. 19:pp. 1]

Program Managers must continue to weigh the GFE alternative throughout all new ship acquisition programs. Systems should not be determined as CFE or GFE until a complete and proper analysis is conducted. There remains no concrete direction. In many cases it will be strictly a judgement call on the part of the SHAPM [Refs. 18, 20].

Definitive black and white policy may be inappropriate and difficult to achieve [Ref. 19:pp. 1]. Ultimately, the SHAPM must determine what equipments will be CFE/GFE based upon his strategy, cost/benefit analysis, availability, timing, and many other tangible and intangible data elements.

E. DETERMINATION OF CFM/GFM

The CFE/GFE procurement decision generally determines the manner in which the SHAPM provides repair parts support for the platform. When the SHAPM directs the procurement of CFE/GFE, FOMIS files are established or updated to reflect the decision. As described earlier, FOMIS feeds the weapons system file with configuration data. At specified times during the ship construction process, SPCC produces Incremental Stock Number Sequence Lists (ISNSL) directing parts procurement for installed equipment. Based on the data transmitted to the WSF through FOMIS, these ISNSL's break down procurement responsibility for both the contractor and the government. Equipment coded as contractor furnished in FOMIS and WSF will produce an ISNSL output list of CFM. Equipment coded as government furnished in FOMIS and WSF will produce an ISNSL output list of GFM. This is the point at which the outfitting stage of the supply support process begins.

Figure 1 provides a graphical view of recent ship delivery averages concerning the CFM/GFM breakdown.

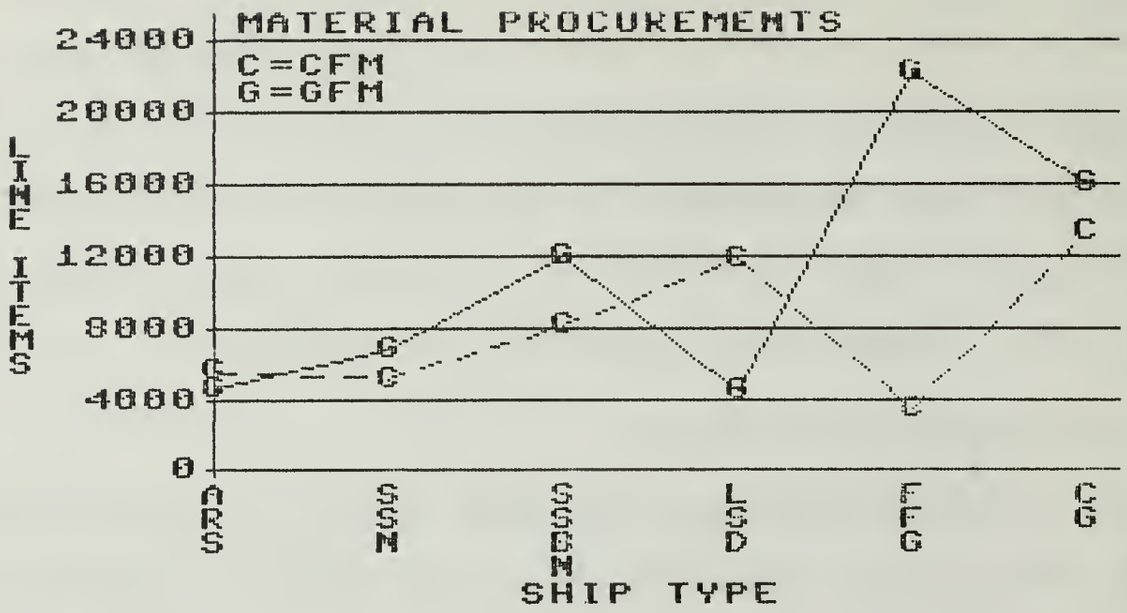

Figure 1. CFM/GFM Material

The data used for the presentation is based upon Storeroom Items (SRI) and Operating Space Items (OSI) requirements determined by the COSAL and AAP [Ref. 21]. These ship types provide a good representation of the breakdown in material procurement responsibilities. The CFM/GFM data can also represent an approximation for the breakdown of who buys the equipment for the class of ship. The only exception is the FFG-7 class program. As will be described later, a change in their parts procurement policy prevents a direct correlation between equipment and material in the graph.

Most shipbuilding programs follow the procedures outlined above for determining who will procure the repair parts to support a given platform. Other methods do exist and can be utilized. The following chapter will discuss and model the key outfitting variables when procuring material as GFM,

regardless of who procures the equipment. Chapter V will provide insight on a pilot program conducted by PMS-399 to outfit FFG-7 class ships with material requirements transferred from CFM to GFM, then requisitioned through the supply system.

IV. MATERIAL OUTFITTING VARIABLES AND REGRESSION COST MODEL

Through the first three chapters we have seen how an intricate supply support process builds material requirements and allowances. These allowances generate contractor procurements or government requisitions for parts.

The purpose of this chapter is to concentrate on the cost of material to the SHAPM. This chapter assumes that the program manager maximizes the use of the suppply system, and provides all outfitting material as GFM. This assumption is necessary to isolate, aggregate, and review the feasibility and cost of outfitting a ship principally through GFM.

A three-fold approach is taken to research this total GFM approach. First, it is necessary to identify and briefly explain the key, common outfitting variables which SHAPM's monitor and fund. Secondly, data are provided for 16 new construction ships delivered to the U.S. Navy during Fiscal Years (FY) 1985 and 1986. Finally, regression analysis is used to model the outfitting variables. This analysis provides a tool to the SHAPM with which to formulate and execute his program's budget.

A. KEY MATERIAL OUTFITTING VARIABLES

Outfitting as described herein, refers to spare parts which are funded through the contract (CFM) or supply system

(GFM) by the program manager. For the purpose of this chapter, outfitting is not intended to apply to such areas as ship store supplies, subsistence, maps, charts, ordnance, Communications Tactical (COMTAC) publications, general publications, library books, Navy directives, or internal ship instructions. While these items are termed outfitting materials, they will not be addressed since there is no funding impact to the SHAPM.

While the SHAPM funds recreational material/ equipment, pre-commissioning crew support, training, and contractor-furnished AAP items, these will not be considered in the model. These items are relatively low in dollar value, and funding decisions reflect a high degree of subjectivity with respect to range, depth and funding level.

1. COSAL Storeroom Items (SRI) and Operating Space Items (OSI)

The COSAL generally has the greatest funding impact of all outfitting variables. Described earlier, this represents the primary authorization document establishing support for equipment and listing equipage required by ship's force to carry out their prescribed mission. With mature programs, the SRI/OSI portion of the COSAL can exceed 85% of the key outfitting costs.

2. General Use Consumable List (GUCL)

This is the COSAL Part III, section E. The GUCL includes a recommended ship's allowance of non-equipment

related consumables designed to provide initial support for a ship's routine maintenance and administrative operations [Ref. 9:pp. 20]. An example of these items include brooms, dust pans, lubricants and oils for planned maintenance, cookware, utensils, etc. These lists are tailored to each ship class and are continually updated.

3. Interim Support, Type III Spares, Contractor Support

This category has many names, but the support concept is relatively the same. In this instance, the government has decided to install an equipment or component in the platform which has not been provisioned or whose spare parts have not been stocked in the wholesale supply system. This precludes a parts draw-down through GFM supply system requisitions. Instead, the government has contracted with the contractor to supply parts support for his equipment until the supply system assumes support responsibility for the fleet. Among the more common systems receiving interim contractor support in the past include the Close In Weapons System (CIWS) and the SLQ-32.

The contractor supports the equipment for operational systems, however to initially outfit ships, an initial buy and loadout of spares is required. These equipments generally fall into the category of GFE, and the SHAFM funds the Participating Manager (PARM) to buy both the equipment and the initial spares. These spares are additive to the COSAL in both range and depth, with the Allowance Appendix

Package (AAP) designed as the authorizing vehicle for loading and maintaining the allowances.

The amount of On Board Repair Parts (OBRP's) and funding required for Type III spares can be directly correlated to the age of the program and the extent to which state of the art equipment is utilized. An Aegis cruiser requires more contractor-supported equipments than the fiftieth frigate.

4. Authorized Medical and Dental Material (AMAL/ADAL)

The Naval Medical Command (NAVMED) reviews each ship's characteristics and design. With this information, they establish the mission and tasks to be performed by the afloat medical and dental departments. This leads to the development of equipment and supplies baselines, including the Type Commander specific requirements. The Authorized Medical/Dental Allowance Lists (AMAL/ADAL) reflect these baselines. The Navy Medical Material Support Command (NAVMEDMATSUPPCOM) has primary responsibility for producing the AMAL/ADAL Initial Outfitting Lists (IOL's).

5. Outfit Supply Activity (OSA) Obligations

Except for certain material identified close to ship delivery and entered in the AAP, the majority of outfitting requirements are determined by the time the loading COSAL is produced. This is approximately at Estimated Delivery Date minus 6 months (EDD-6).

OSA obligation data is a key variable since it identifies the obligation of funds within the last three months of construction to attain outfitting goals. These funds can reflect double-spending. If an outstanding allowance item is located somewhere in the supply system, a duplicate requisition can be entered in the supply system to enhance its availability by delivery. This is also the time when the universe of outstanding requisitions is small enough to allow personnel at the Supervisor of Shipbuilding (SUPSHIP) and the OSA to audit reports, ensuring that all allowance items are on-hand or on order. Matching a contractor shortage list and OSA CRASP files is one way to identify allowance items which must be ordered or reordered.

Delivery dates have a significant impact on this category. If a ship delivery is accelerated, an increase in obligations may be noted. For delays, more time is available for the supply system to react, thereby decreasing the need for reordering material.

In all cases, it would be impossible to budget for this category, but the SHAPM must nevertheless recognize its existence.

6. As Required/Fabrication/Select Items (AR/FAB/SEL)

The IF-11 report of each Incremental Stock Number Sequence List (ISNSL) identifies allowance items which must be manually reviewed at the NSA/SUPSHIP. The quantity decision for AR is left to the pre-commissioning crew and the

SUPSHIP. The FAB items are those which are not in the supply system and must be manufactured. SEL items provide for make/model decisions such as typewriters. These allowance decisions are authorized through the AAP and in most cases represent Operating Space Items (OSI) rather than Storeroom Item (SRI) decisions.

7. Forms (1I COG)

The SHAPM funds the initial outfitting allowance list for forms. Like the GUCL, the IOL for forms is tailored to the class of ship. The Naval Publications and Forms Center (NPFC) maintains the data base and produces the allowance lists.

8. Government Furnished Allowance Appendix Package (GF AAP) Obligations/Budget Estimates

These requirements reflect GFM range and depth allowance additions after producing the loading COSAL. Most of the high dollar value AAP additions will be government furnished (such as DLR's) as opposed to contractor furnished. These figures provide a combination of actual data and budget estimates for ships.

Having completed a description of the key outfitting variables common to all shipbuilding programs, the following section applies historical dollar values to these variables, explaining the numeric formulation and origin.

B. NEW CONSTRUCTION SHIP DATA (FY85/86)

Data for the key variables cited above are presented in Appendix B. Each of these items have been broken down to quantify each of these areas.

* The COSAL and GUCL line item and dollar value figures are extracted from the load COSAL and GUCL summary sheets for the particular platform [Ref. 22].

* Type III dollar values have been extracted from Ship Planning Documents (SPD) for each ship [Refs. 23, 24, 25, 26, 27, 28, 29].

* AMAL/ADAL lists are produced for each ship class. The data therefore represents the range of items and the dollar value for those allowances by ship class [Refs. 30, 31].

* The OSA obligation data reflects monthly incremental requisition obligations from the OSA's memorandum records commencing at EDD-3 for each ship [Refs. 32, 33, 34, 35].

* AR/FAB/SEL data is provided through extending marked-up copies of the IF-11 reports. The author makes the assumption in that with the exception of the first ship of the class, the OSI package or COSAL AEL's are reasonably constant. Since this category is predominantly OSI, any IF-11 can be expanded to ships within the class [Refs. 36, 37, 38, 39, 40, 41, 42].

* Allowance lists for forms are generated by ship class. This class listing is extended and applied to all ships of the class [Refs. 43, 44, 45, 46, 47, 48, 49].

* The GF AAP data reflect both actual dollars obligated by the OSA's and/or budget estimates which have not been succeeded by actual data [Ref. 50].

* The ship's compliment also provides explanatory capabilities [Ref. 51:pp. 694, 696, 706, 724, 736, 749, 763].

Appendix B also provides the reader with a column summarizing the total dollar value per ship for outfitting these key areas. It is not surprising to see the significant

values involved. The author again must point out that these are the most common, key variables but are by no means all inclusive. Other variables not addressed include the nuclear COSAL, aviation material support, and test equipment.

The nuclear (Q) COSAL is a classified document listing equipment, parts, tools, and chemicals for the operation, overhaul, and repair of the nuclear reactor plant. These parts are outfitting material for SSN's, SSBN's, and CVN's.

For aviation platforms such as CVN-71, an Aviation Consolidated Allowance List (AVCAL) is provided. This list is derived from all allowance/outfitting lists applicable to a particular group or squadron.

Finally, the Ship's Portable Electrical/Electronic Test Equipment Requirements List (SPETERL) identifies required portable electrical/electronic test equipment for installed equipments and systems.

As you see, there are many variables involved in outfitting new construction ships. Some of these items are unique to the class of ship while others are more common to all ship types. The next section will discuss the analysis of only the common categories, focusing on those variables containing the significant dollar values. The result enables program managers to formulate and execute portions of their budgets using analytical forecasting techniques.

C. OUTFITTING ASSUMPTIONS AND MODELS

1. Assumptions and Data Explanation

Before discussing the details of the model, certain data manipulations and assumptions must be explained. First, all values except AR/FAB/SEL and 1I COG forms have been inflated 4.3% for ships delivered in 1985. This figure represents the difference between the 1985 and 1986 fixed-weight price index for national defense purchases of goods and services (other non-durable goods) [Ref. 52:pp. 111]. This figure is used since 1986 inflation figures are not yet available and the rate has remained fairly constant over the past few years. The AR/FAB/SEL and 1I COG have not been inflated. The listed values have been applied across all ships of the class with many prices extracted from 1986 listings.

The LSD-42 AR/FAB/SEL dollar value does not include the value of troop, as opposed to ship's company, life jackets. This allows more commonality with other ships reviewed in the model. Also, the dollar value for CG-49 and 50 and SSBN-731 and 732 are adjusted to include the cost of fire retardant coveralls listed in all other ships allowances.

The SSN-718's Type III dollar value is estimated at $75,000. The configuration is assumed to be stable prior to the introduction of the Vertical Launch System (VLS) in SSN-719. Additionally, it is assumed that system

provisioning is substantially complete and that only minimal contractor supported equipment existed during construction.

LSD-42's forms dollar value is estimated using the regression model provided later in the chapter. Regression analysis for the total dollar value uses this figure.

The CVN-71's AR/FAB/SEL dollar value is also determined using the regression model for forms provided. The total dollar value model uses these data.

Values for SSBN-731 and 732 GF AAP are estimates using the mean of all SSN GF AAP dollar figures.

2. Regression Model

The regression models provide two methods for predicting the cost of outfitting an all GFM ship. First, individual equations break out the key variables for forecasting, using line items and ship's complement as independent variables. The individual predictions can be summed to provide a total cost figure. Secondly, the total cost for all key variables is predicted using a multiple regression equation with four independent variables. The sample size for all models is 16 (n = 16).

a. COSAL Forecasting

The regression equation is:

$$\text{COSAL dollar value} = \underset{(t=0.90)}{4.9679138} * \underset{(t=8.12)}{\text{COSAL line items}} \quad (1.4981)$$

$$S_e = \$3,598,141 \quad R^2 = 80.75\% \quad F = 65.98$$

For this regression, data transformation to natural logarithms improved the forecasting model. The different COSAL computational models are not addressed in this model. The data does not discriminate between whether the MCO, FLSIP, or MOD FLSIP COSAL computational model was used at SPCC.

The t-ratios are shown under the equation. The t-distribution is used to make significance tests for the true slope and intercept. In the case of these models, a value of 2.63 or more provides 99% assurance that the independent variable contributes to predicting the dependent variable, in this case the COSAL dollar value.

The standard error of the estimate (S_E) measures the dispersion of data around the regression line, sometimes called the residual standard deviation. In the equation above, $2S_E$ provides a 95% confidence level that when forecasting with this model, the predicted COSAL dollar value will be within 2 * $3,598,141 of the actual figure. [Ref. 53:pp. 409]

The F-statistic is an alternative test to the t-test for the null hypothesis of no predictive value. The F tests the slope and intercept of the entire equation simultaneously. For the regression models in this chapter, a F value greater than 8.86 symbolizes 99% confidence that the independent variable has predictive value. [Ref. 53:pp. 415, 750]

The coefficient of determination (R^2) value provides a percentage of the total deviation in the dependent variable which is explained by the fitted regression line. [Ref. 53:pp. 424]

b. GUCL Forecasting

The regression equation is:

$$\text{GUCL dollar value} = -\underset{(t=-0.62)}{70737} + \underset{(t=2.80)}{509.5} * (\text{GUCL line items}) - [\underset{(t=-5.24)}{.41237} * (\text{GUCL line items})^2] + [\underset{(t=9.47)}{.00009377} * (\text{GUCL line items})^3]$$

S_E = \$56,957 R^2= 99.4% F = 628.85

This equation is a polynomial regression of the third order. No transformation of data is necessary to use this equation.

The reader will note t-ratios for some intercept values to be less than 2.63. In practice this parameter is of less interest than the slope. There is no reason to hypothesize that the true intercept is 0 or any other value. The t-ratios are listed for information purposes only. [Ref. 53:pp. 412, 416, 747]

c. AMAL/ADAL Forecasting

The regression equation is:

$$\text{AMAL dollar value} = \underset{(t=5.42)}{51279} - \underset{(t=-7.06)}{137.39} (\text{AMAL line items}) + [\underset{(t=22.58)}{.159165} (\text{AMAL/ADAL line items})^2]$$

S_E = \$6,999 R^2= 99.8% F = 3465.75

d. AR/FAB/SEL Forecasting

The regression equation is:

$$\text{AR dollar value} = \underset{(t=8.14)}{47331} + \underset{(t=8.40)}{204.79}\ (\text{AR line items})$$

S_E = \$15,862.10 R^2= 64.5% F = 66.33

Heteroscedasticity (non-constant variance) was found in the original regression. To provide a more accurate estimate and predictive equation, the dependent variable is transformed by dividing the AR/FAB/SEL dollar value by the line items. The independent variable's reciprocal is used. In simple terms, 1/AR,FAB,SEL forms the independent variable. [Ref. 53:pp. 529]

e. 1I Cognizance Forms Forecasting

The regression equation is:

$$\text{Forms dollar value} = \underset{(t=6.35)}{3375.3} + \underset{(t=15.81)}{9.855}\ (\text{ship's complement})$$

S_E = \$1827 R^2= 95.1% F = 24.981

It is noted that as the size of the ship and its crew increases, the greater depth requirement for forms exists. To this extent, the size of the entire crew, officers and enlisted, provided a good variable from which to build the model. There is little correlation between the number of line items and the dollar value of the forms required.

Estimates for a through e above could now be summed (adding Type III, OSA obligations and GF AAP estimates) to provide a forecast of the required funding to

support the key outfitting variables. If a program manager desires to forecast the total outfitting cost of an all GFM ship as opposed to reviewing variables incrementally, an alternative is provided below. This model has summed the dollar values of all key variables and uses multiple regression to determine which independent variables predict this sum most accurately.

f. Total Dollar Value Forecasting

The regression equation is:

$$\text{Total dollar value} = -5027269 + 1114.63\ (\text{COSAL line items}) \quad (t=-9.69) \quad (t=22.87)$$
$$- 4705.4\ (\text{GUCL line items}) \quad (t=-14.06)$$
$$+ 1.34727\ (\text{Type III dollar value}) \quad (t=52.57)$$
$$+ 10717.3\ (\text{AMAL/ADAL line items}) \quad (t=15.84)$$

S_E = \$757,845 R^2= 99.8% R^2 adj = 99.8% F = 165.266

This model wraps all dollar values (COSAL, GUCL, Type III, AMAL/ADAL, OSA obligations, AR/FAB/SEL, Forms and GF AAP) into one multiple regression. Shown above, the best forecasting model is one utilizing four independent variables to predict the total outfitting dollar value. Since these four variables can be estimated with reasonable accuracy by the SHAPM prior to ship construction, this model provides a good budget formulation tool.

Tests of the models' predictive capabilities are not provided in this chapter because of the small sample size

available for modeling. All data that has been accumulated are necessary to develop the models shown above.

The important feature of all the regression models in this chapter is that the relevent range includes the smallest to the largest ships in the Navy's inventory. This enables universal application to any SHAFM contemplating a total GFM outfitting strategy.

The following chapter details the results of a test case in which a mature shipbuilding program transferred a majority or its CF material requirements to GF outfitting. As the government provides more of the outfitting material, the regression equations and analysis of this chapter take on added meaning and value.

V. RESULTS OF CFM-GFM TRANSFER TEST CASE

Late in 1983, NAVSEA embarked on an innovative approach toward the procurement of outfitting material. Under the direction of PMS-399, the FFG-7 class program manager, material requirements earmarked for contractor procurement were diverted to the OSA for requisitioning through the supply system. [Ref. 54]

This procurement modification included Defense Logistic Agency (DLA) and General Services Agency (GSA) cognizance material identified in ISNSL reports. In supply terminology, this represents the 9-cog requirements. The contractor would continue to procure all non-GSA/DLA CFM requirements.

This decision effected the transfer of approximately 5,000 line items to government responsibility [Ref. 16]. For the SUPSHIP, the SHAPM's waterfront agent, this translated into a significant workload [Ref. 55]. Manually identifying and segregating requirements for requisitioning is a time consuming task. Outfitting requisition volume at the OSA also increased with NSC Charleston anticipating a seventeen percent increase in the number of requisitions processed. There were no provisions to increase activity personnel resources while implementing this transfer policy [Ref. 56].

A. CFM/GFM PROCUREMENT AND BUY OUR SPARES SMART (BOSS) INTEGRATION

The NAVSUP BOSS program became one of the driving forces in this CFM to GFM transfer effort. Based on this program and a review of ISNSL products, the SHAPM decided to implement the transfer initiative. [Ref. 57]

It is important to digress and hypothesize what the BOSS program initiated which would lead a SHAPM to embark on such a change in his outfitting strategy.

In the early 1980's, the Defense Department received substantial criticism for its spare parts procurement policies and pricing. In response to the growing publicity and media attention, the Secretary of Defense (SECDEF) developed a ten point plan to reduce the possibility of DOD pricing abuses in the future. These ten points include: [Ref. 58:appendix I]:

1. Offering incentives to increase competitive bidding and reward employees who pursue cost savings.
2. Disciplinary action for employees negligent in implementing these procures.
3. Alerting defense contractors to the seriousness of the problem and of DOD's firm intention to keep prices under control.
4. Competition advocates are to challenge orders not made competitively or appear to be excessively priced.
5. Refusal to pay unjustified price increases.
6. Accelerate reform of our basic contract procedures.
7. Obtain refunds in instances where overcharges occur.

8. Where alternative sources of supply are available, cease doing business with contractors guilty of unjustified and excessive pricing, and who refuse to refund any improper overcharges.

9. Spare parts audits and investigations will continue.

10. DOD purchases billions of dollars of parts each year. The quality and prices are generally satisfactory. It is everyone's responsibility to ensure that not one taxpayer's dollar is wasted.

The Chief of Naval Operations (CNO) issued supporting policy for all Navy personnel. Two key points include [Ref. 59]:

* Use the supply system for parts and supplies. Do not procure from contractors items already available in the supply system.

* When spare parts are not obtainable from the supply system, buy them from the most economical source.

The BOSS program has been an excellent success story. A reduction of $193 million in expenditures for spare parts was achieved in FY-84 alone. The CNO's goal is one of promoting competition and fair prices, while encouraging all personnel to recognize and challenge prices they believe are out of line. [Ref. 60]

B. TEST EXPANSION TO INCLUDE NAVY COG MATERIAL

With the DLA/GSA test providing satisfactory results, NAVSEA decided to expand the test to include Navy cognizance material. The REUBEN JAMES (FFG-57) became the test bed for this latest strategy. [Ref. 61]

For this test, SPCC screened the Navy cognizance items computing for allowance in the first ISNSL. If the

requirement had sufficient quantity on hand in the supply system (i.e., an item in long supply), it became a CF to GF transfer. These items would then be ordered on a fill or kill basis. A fill or kill requisition is one where parts are furnished if available in stock, but automatically canceled if the material is not on hand. Items killed at the Inventory Control Point (ICP) in this case were returned to the contractor for procurement as CFM. [Ref. 61]

C. TEST RESULTS

1. DLA/GSA (9-Cog) Material Transfer

For REUBEN JAMES (FFG-57), receipts totaled 100% for first and second ISNSL DLA/GSA material requirements. Overall, receipts totaled 98.9% of requirements at delivery. [Ref. 62]

These statistics include approximately 5300 items transferred from the contractor to the government for procurement. This percentage also exceeds the goal of 97% material availability at delivery.

Notwithstanding the receipt percentages attained, the contractor now had an opportunity to focus his attention on a much smaller universe of procurement buys, enhancing the final CFM statistics [Ref. 16]. Historically, GFM material availability has lagged CFM percentages at ship delivery. By including DLA/GSA receipts, the overall percentage of material provided by the government increased.

Overall, no insurmountable problems appear in procuring CF DLA/GSA material through transfer to GFM.

2. Navy Material (1H/7H/7G Cog) Transfer

A screening of 220 items took place at SPCC on Navy unique requirements for the REUBEN JAMES (FFG-57) first ISNSL. A total of 38 items were in long supply and cited for CF to GF transfer. After the OSA submitted the funded requisitions, 35 items were issued and 3 requisitions were rejected/canceled.

The SHAPM determined that the time, effort and cost required to screen, order, and monitor Navy cognizance items generally outweigh the benefit of utilizing the supply system.

3. General Test Comments

A few items that must be kept in mind when analyzing the FFG-7 class CFM to GFM test:

* The FFG-7 class is a mature program. The configuration baseline has been stabilized to the point where most installed equipments have been provisioned. With provisioning complete, material requirements have already been identified and stocked in the wholesale supply system.

* Transferring requirements from CFM to GFM places pressure on the supply system to perform. The SHAPM is then in a position to proactively monitor the outfitting process.

* No reservation codes were placed on the Navy-unique items identified for FFG-57, therefore there are no guarantees that material will be on the shelf to match with an incoming requisition.

* Care must be taken in requisitioning DLA/GSA material. Double spending can occur when ship specification items procured as end cost material is also requisitioned as outfitting material. Examples include anchors, anchor chain, and refueling at sea gear. [Ref. 16]

* The SHAFM's price for material in the supply system includes a surcharge for system operation and overhead.

* Other than Planned Program Requirements (PPR's) established at SPCC, there remains no planned stockage of outfitting material in the wholesale or retail level system. System stock is therefore drawn to outfit a ship for future operations, when an unknown, but near term fleet requirement may be identified.

* Material identified as available from a fill or kill screen does not necessarily ensure the material will be on the shelf at the time it is requisitioned [Ref. 18]. The supply system is dynamic. Without a system for reserving material, what is here today may be gone tomorrow.

We have now examined the supply support process, the procurement of equipment and material, historical data analysis, and a test involving the transfer of requirements from the contractor to the government. The following chapter looks at the implications and impacts that a full GFM decision would have on the Program Support ICP (PSICP) and established contracts which are in effect today.

VI. IMPACT OF CHANGE FROM CONTRACTOR FURNISHED MATERIAL (CFM) TO GOVERNMENT FURNISHED MATERIAL (GFM)

As described earlier, there is continuing debate whether Program Manager's (PM's) should use the supply system for their spare parts requirements. We reviewed the test results for the CFM to GFM transfer within the FFG-7 class shipbuilding program, concluding that it is cost effective and reliable to procure all DLA/GSA cognizance material through the supply system.

Notwithstanding this successful test, any transfer of 5,000 line items per ship to the government has certain impacts which must be addressed prior to establishing overall NAVSEA policy and direction. The impacts to be reviewed in this chapter include: 1) contractual obligations and modifications, 2) ICP support functions, and 3) political and economic impacts regarding any change in transfer policy.

A. CONTRACT OBLIGATIONS AND MODIFICATIONS

The SHAPM uses a contract modification as his vehicle to transfer procurement responsibility from the contractor to the government. Contract modifications are defined as any written change in the terms of a contract [Ref. 11:section 43.101]. There are five general types of contract modifications: 1) administrative changes, 2) change orders,

3) supplemental agreements, 4) orders for provisioned items, and 5) terminations for convenience and for default [Ref. 12:section 26-101].

Contract modifications can also be bilateral or unilateral. Bilateral modifications are contract modifications signed by the contractor and the contracting officer. Uses of bilateral modifications include making negotiated equitable adjustments resulting from the issuance of a change order, definitizing letter contracts, and reflecting other agreements of parties which require modifying the terms of contracts. Unilateral modifications are simply signed by the contracting officer and imposed on the contractor without negotiation. Their uses include making administrative orders, issuing change orders and termination notices, and making changes authorized by clauses other than a changes clause. [Ref. 11:section 43.103]

1. Contract Clauses

The contract clause requiring modification is generally termed Repair Parts, Tooling, and Equipage. This clause represents an estimate or ceiling that the contractor cannot exceed when procuring parts. This estimate is also subject to redetermination based on actual performance [Ref. 63].

When transferring procurement responsibility from the contractor to the government, the estimate in this

clause is reduced. It must make sense however, in that the government cannot reduce the clause past the point where the reduction exceeds the amount the contractor has already spent on material buys. Since this modification affects contract provisions other than price (material), only the PCO may administer the contract modification [Ref. 64:section 43.204].

As described earlier, the clause dollar value represents a target cost. The contractor will submit his final proposal after ship delivery to recoup actual expenses for the material. The Administrative Contracting Officer (ACO) generally negotiates the final settlement. [Ref. 63]

When the contractor submits his final proposal, a thorough review is conducted on funds expended per line item under the contract clause. People are employed full time validating the proposal. Also, since the actual material buys and the proposal submission are most often separated by years, inflation, overhead, and profit must be addressed. Adjudicating proposals represents a significant cost sometimes overlooked in the CFM/GFM decision process [Ref. 65].

2. Contract Modifications for CFM to GFM Transfer

Supplemental agreements and change orders are the two types of contract modifications the SHAPM can use to transfer procurement responsibility from the contractor to the government. Changes of this nature are considered to be

within the changes clause of the contract [Ref. 63]. This clause permits the PCO to make changes in designated areas, bilaterally or unilaterally, within the scope of the contract [Ref. 11:section 43.201].

The preferred method for changing the contract clause is through the use of the supplemental agreement. This can reflect an agreement reached with the contractor in the negotiation of change orders and maintains a working relationship between the contractor and the government. If the contractor balks at the government's proposal to reduce the dollar value in the clause, the PCO retains the authority to unilaterally reduce the threshold. [Ref. 66:section 26-204]

Change orders are written orders signed by the PCO, directing the contractor to alter the contract pursuant to the contract's changes clause. The PCO can order this change without the contractor's consent [Ref. 11:section 43.101]. No unilateral change can be made outside the terms and conditions of the contract other than those in writing and signed by the PCO pursuant to the changes clause [Ref. 66:section 43.104].

3. NAVSEA Contract Modification Process

NAVSEA uses their Procurement Request (PR) process for planning and controlling contract awards and modifications. This process also incorporates provisions for deobligating contract funds. Department of Defense

policy requires the prompt release of unexpended dollar balances determined to be excess of known contractual requirements [Ref. 66:section 43.105].

The routing for individual PR's depends on their classification. There are two classes possible: 1) New Procurement (NP) or 2) Other Than New Procurement (OTNP). NP actions require many steps not considered necessary for processing OTNP [Ref. 67:pp. 2-8]. The contract modification for changing the clause regarding CFM to GFM transfers falls under the OTNP procedure.

In this case, the SHAPM initiates a PR, attaching a "ZPR" form or funding sheet for use in deobligating funds. After the PM's internal review is complete, the package passes through security. Security reviews all PR's to determine if the contractor may require access to or generate classified data during the performance of the contract [Ref. 67:pp. 2-6]. Upon completing this stage, the PR is passed to the Contracts Directorate, NAVSEA 02 for action. Here the PR is transformed into a contract modification. The contract modification passes to NAVSEA 01 where preparation of a fiscal sheet takes place. This documentation reflects the SHAPM's desire to change the contract clause and deobligate a certain dollar amount. At this point, the contract modification is mailed to the contractor for signature. As described earlier, no negotiation is required unless the contractor disagrees with

the provisions of the modification. An OTNP passing through the above process can expect to take approximately two months before releasing a signed modification [Ref. 63].

B. ICP SUPPORT FUNCTIONS

The Navy Ships Parts Control Center (SPCC) plays a very prominent and essential role in the supply support of all new construction ships. Specific areas within the ICP feeling the impact of an overall CFM to GFM transfer policy include: 1) provisioning, 2) Planned Programmed Requirements (PPR), 3) COSAL production, and 4) contracting.

Any change in procedures or policy regarding increased government support will surely be reflected in additional costs up front. Concerning the costs for these changes or impacts however, we must remain conscious of the learning phenomenon which often occurs [Ref. 68:pp 350]. This learning curve effect would tend to lower the cost of implementing any change in ICP services over the mid to long term.

1. Provisioning

The provisioning process has a major effect on the supportability and maintainability of new construction ship equipments/components at delivery. As discussed in Chapter I, this process transforms raw data into information for input into ICP files. These data ultimately impact the spare parts requirements computation.

A bottleneck can occur within this process when SPCC receives PTD for revisions to items previously provisioned. Also, shipbuilder's may provide a Statement of Prior Submission (SPS) in lieu of complete PTD. These SPS's apply to equipments/components which are already provisioned and have assigned APL's. At times, these cannot be used for application to the particular platform because of incompatible maintenance plans or variations in equipment (i.e., Coast Guard, Military Sealift Command ships) and must be rejected.

SPCC may reject inadequate or insufficient PTD. Before rejecting a PTD package, the relative priority versus PTD flaws/discrepancies is reviewed. A balance must be reached regarding these criteria. For HM&E equipments/components, the actual reject rate runs between 10-15%. [Ref. 69]

Provisioning is a double-edged sword for the ICP. Before the process can commence, PTD must be received in proper format and detail. On the other hand, the final loading COSAL is generally produced 5-6 months in advance of the delivery date to provide reasonable time to procure parts. Therefore, the earlier PTD is received, the earlier files load can occur, generating a more complete COSAL. As you can imagine, certain events must occur prior to providing this PTD. First of all, detailed design must be complete and a drawing release/material ordering schedule

promulgated. Only at this time can a PTD Submission Schedule (PTDSS) be arranged [Ref. 17]. This PTDSS provides for certain percentages to be met during ship construction, with the intent being 100% PTD submission in time for files load and load COSAL production by SPCC [Ref. 10]. While contractors generally meet this schedule, most of the PTD received at the ICP throughout the beginning and middle of the period comes in the form of SPS. In this case, the equipments have been provisioned, files loaded, and parts generally stocked in the supply system. The major problem comes toward the end of the project when receipt of non-standard PTD takes place. In these cases, a big effort commences to assign APL's, load files, assign stock numbers, and complete provisioning for the equipment. Many times this cannot be accomplished in time for the loading COSAL, and must be added through the Allowance Appendix Package (AAP).

In order to transfer CFM requirements to GFM, the SHAPM needs reasonable assurance that equipments/components are provisioned, files loaded, and COSAL allowances computed in the most accurate and timely manner possible. The supply system requires adequate lead time to fill requisitions or procure parts for new ships. Parts not identified in the load COSAL become part of the AAP, and in most situations, provide insufficient lead time to enable procurement through the supply system prior to ship delivery.

The author feels that non-standard PTD must be required earlier than current practice dictates. This may require a change in the PTDSS to breakout systems or equipments known to be new at the outset. This also provides for increased management visibility to ensure timely submission of the documentation to the ICP. The alternative is to contractually invoke equipment/component standardization. This will assure the SHAPM that after the lead ship of the class, ICP files should be loaded, system stock requisitioned, and parts requirements in the load COSAL, allowing adequate lead time for requisitioning.

2. Planned Program Requirements

Planned Program Requirements (PPR) represent material identified in advance of the actual required draw-down date. In addition to new construction requirements, SPCC also loads PPR's for Ship Alteration (SHIPALT) and overhaul material. [Ref. 6:pp. 3-6-01]

For new construction ships, PPR's are loaded during provisioning. It is important to note that PPR's are generally loaded for GFE only. This includes a majority of the electronic and combat system/ordnance systems and equipment. There are two ways to load PPR's:

a. Manual Identification - In this case, the SHAPM or SPCC decide that they want to execute a buy through an option under the end item contract for spare parts. In all instances SPCC will approve and load PPR's into the ICP files, providing a listing to the SHAPM identifying what items have been loaded.

b. Automated J-15 Computational Model - Once a GF equipment/component completes the provisioning process, it is run through the J-15 computational model which will identify or forecast future needs. The items generated out of the single provisioning system can be automatically loaded as PPR's for the SHAPM. [Ref. 70]

The Navy Stock Fund (NSF) buys funded PPR's. Funded PPR's are those established with the explicit intent of expending procurement dollars to satisfy a requirement [Ref. 6:pp. 3-6-01]. Based on Program Support Data (end item, cost, material support date, installation schedule, FTD, etc.) provided by the Hardware System Command (HSC), SPCC builds a budget for a NSF buy-in. The figure is adjusted as the budget year approaches. Through the manual or automated methods discussed above, SPCC executes the PPR program using NSF dollars. NAVSEA requisitions perform the buy-out of these items from the supply system using COSAL outfitting funds. These funds originate from the Shipbuilding and Conversion Navy (SCN) appropriation.

With regard to PPR's and outfitting requirements, even with the advanced procurement of this material, no reservation codes or procedures exist to ensure availability in the system once requisitioned. Unlike material for SHIPALT's and the Trident/FBM programs, there is no purpose code protecting stockage levels in the supply system. Material cited as a PPR for outfitting can be released and issued at the stock point level without authority of the item manager [Ref. 71]. Also, PPR's are coded by Unit

Identification Code (UIC) and given a Required Delivery Date (RDD). At the RDD-60 and RDD-90 day marks the Item Manager (IM) receives a reminder to review his options. Unfortunately, there is no way to see if the item has been requisitioned from the system. There is no match set up between a loaded PPR and a NSA/OSA requisition.

A desire to transfer CFM to GFM will likely increase the number of PPR's loaded for new construction ships. This can be very sensitive and represent certain risks and uncertainties by procuring high dollar value items well in advance of computed needs [Ref. 70]. Advanced procurement of PPR's doesn't necessarily mean they will compute for allowance in the loading COSAL. Additionally, the SHAPM has no guarantee that the material will be available to him for requisitioning through the supply system.

Increasing GFM will likely expand NSF funding required for material buy-in. NAVSUP will also absorb the resourcing costs associated with loading PPR's and procuring Navy cognizance material, currently bought by building yards.

3. COSAL Production

A decision to provide material as GFM would have a slight positive affect on the COSAL production operation of SPCC. This effort would reduce the need for certain CF ISNSL reports, perhaps achieve a small savings in paper, report segregation and shipping, and possibly decrease

computer time required to run an incremental COSAL. As it is, running COSAL's is only a small percentage of total computer time available at SPCC. [Refs. 72,73]

If all material is designated GFM, certain parts of the churn associated with the ISNSL process would disappear. Churn is that term which describes requirements that oscillate as adds and deletes to ship allowances which occur between incremental COSAL's. For example, a National Stock Number (NSN) may appear in the first ISNSL establishing an allowance of 3 each. On the second ISNSL, that same NSN's allowance may result in an allowance decrease to 1 each. On the loading COSAL, the NSN's allowance may increase to 10 each. This churn can be caused by many factors and is being investigated by the Fleet Material Support Office (FMSO). By considering a total GFM package, 2 causes of churn can be eliminated. First, CF to GF and GF to CF switches, adds and deletes. These items show as GF or CF in one ISNSL, only to reverse themselves in the next. This increases ordering costs and creates excess inventory at the building site. Secondly, redundancy of CF/GF allowances is eliminated. For example, an NSN computes for allowance of 1 each for CF and GF. When the loading COSAL produces final allowances, a total requirement of only 1 each exists. [Ref. 72]

The ISNSL and COSAL process is dynamic. Resolicitation will provide increased flexibility in scheduling and output. COSAL production will no longer be

held hostage to the batch process currently in use today. This will certainly enable SPCC to provide even greater service to its customers.

4. Contracting for Parts by the ICP

Any deviation from current policy to transfer parts from the contractor to the government (unless designated by agency cognizance such as GSA/DLA) will increase outfitting parts procurement at the ICP. This additional workload presents new resourcing problems. Prior to discussing the unique impacts of additional buys, we need to review which areas might be affected and the criteria SPCC follows in the contracting process.

A spot-buy occurs when a need arises for parts, equipment or other high priority material not available in the supply system. These spot-buys can be large purchases, greater than or equal to $25,000, or small purchases, less than $25,000. Though large purchases historically make up the majority of SPCC's contracting workload, outfitting requisitions constitute small purchases for the most part. [Ref. 6:pp. 3-19-01,02]

The Procurement Administrative Lead Time (PALT) is internal to SPCC and tracks the time required to award a contract after receipt by SPCC. The PALT for requisitions remains less than system stock requirements, but in any event averages 80-85 days for small purchase requisitions [Ref. 74]. This average includes all small purchases

whether requiring synopsis ($10,000 - $25,000) down to purchases less than $1,000 where awards can be made without competition if a fair, reasonable price is received.

One of the reasons for delays in awarding contracts involve The Competition In Contracting Act (CICA) of 1984. Small purchases between $10,000 and $25,000 must now be published in the Commerce Business Daily (CBD). Taking 6 days for transmission, 15 days for holding prior to issuing the solicitation and 30 days for submission of proposals, this has drawn out the process at least 51 days [Ref. 74]. In the area of outfitting, time is critical in initiating buys, receiving stock, and loading it onboard the platform. Considering current practice of publishing loading COSAL's at 6 months prior to delivery, this delay could have a negative impact on some outfitting requirements. Increasing GFM would tend to centralize procurement and provide for larger volume buys. It only takes 2-3 Depot Level Repairables (DLR) to meet the $10,000 floor.

SPCC has commenced posting requirements for items $5,000 - $10,000 in a bid room. This initiative has met with larger numbers of inquiries for Request For Quotations (RFQ) and has increased contractor submissions. While increasing the level of competition, it also extends award times for this range of small purchases. [Ref. 74].

One group within SPCC becomes very important in some instances when expediting procurement. The technical

operation screens requisitions submitted with part numbers and other varying identification. The technical package they send to contracting can affect the contract award depending on its completeness. If the package is good, sourcing will be facilitated.

Because outfitting new construction ships is a function of so many variables, not the least of which is time and schedule, the impact of parts procurement can be handled many ways. For a transfer to mostly GFM, the author feels three ways exist to meet time tables and mandated goals for outfitting new construction ships. First, the current system could remain intact except that outfitting requisitions be given a higher priority. Visibility will enhance the effectiveness in awarding contracts for material. Secondly, a separate section could be added to the contract group whose sole mission is to handle the high priority outfitting requirements. They would be confined to outfitting requisitions only, but receive the benefits of the entire SPCC organization and ADP improvements currently underway. Finally, parts procurement could be contracted out itself. The advantages include shortened Procurement Lead Time (PCLT), ultimately providing more material to the fitting out site sooner. The contractor is not held to CICA, therefore he can expedite procurements. The government should ensure compliance with the provisions of the Buy Our Spares Smart (BOSS) program regarding fair and

reasonable prices. If all outfitting is contracted out, the government may find itself relying on one company who has built a data base that cannot be kept competitive. This could develop into a sole source problem where the contractor is in a position to negotiate higher fees.

As we have seen, there are many areas affected within the ICP for a wholesale transfer of CFM to GFM. While the learning curve would help achieve increased economies of scale, a review of all aspects of the decision is required to ensure that any economic and efficiency gains do not occur at the risk of decreasing the level of outfitting effectiveness. In this case, a loss of effectiveness would translate into material availability goals not being met at ship delivery.

C. ECONOMIC AND POLITICAL FACTORS ASPECTS/EFFECTS

Transferring contractor requirements to the government would not significantly alter geographical or local economies. Many of the shipbuilders today subcontract parts procurement, thereby minimizing their the labor force associated with procuring repair parts. There remain a few shipbuilders, such as Bath Iron Works (BIW), who continue to procure CFM with their own staff and who could be adversely affected by this transfer decision. These unskilled workers may find difficulty relocating and transitioning to new jobs. [Ref. 75:pp. xiii].

Outfitting ships has always been a sensitive issue. These sensitivities include the strategy, funding, costs, schedule and a multitude of other areas affecting the program manager. The SHAPM deals within a matrix organization which maintains its own policies, yet must interact with other Systems Commands (SYSCOM) such as the Naval Supply Systems Command (NAVSUP) to attain program goals and objectives. Politics also play a role in the evolution and execution of a program. A policy such as transferring CFM to GFM has proponents and antagonists. There are many advantages and disadvantages to this idea, along with many middle of the road alternatives. Though policy, procedure, and politics generally emigrate from the Washington forum, the author recommends that change occur only after a thorough review of all alternatives and adequate consideration is given to the impact on the field activities who must implement the changes.

VII. CONCLUSIONS AND RECOMMENDATIONS

This thesis achieves the goals and objectives established in the initial chapter. It provides an in depth description of the outfitting process as it relates to new construction ships. Regression models prescribe alternative methods for the SHAPM to formulate and execute his budget. Finally, the impact of shifting parts procurement responsibility to the government is addressed.

A. CONCLUSIONS

The Navy supply system operates to provide "Service to the Fleet." Part of this responsibility includes supporting new systems and platforms. Outfitting new construction ships tests the supply system's ability to provide that material support within stringent goals and guidelines.

Policy guidance exists regarding the procurement of ship equipment and material. Contractors will ordinarily furnish all equipment for performing government contracts. Maximizing Contractor Furnished Equipment (CFE) gives the SHAPM more control over configuration, standardization, and equipment availability than is available from within the matrix organization.

The support decision (CFM/GFM) can be made independently of who procures the installed equipment. This break-out

possibility provides the government an opportunity to weigh the alternatives and perform cost/benefit analysis within each program.

Ship outfitting costs represent a significant investment for the SHAPM. A proactive parts procurement policy is mandatory to prevent an inefficient use of scarce resources. The subjectivity and iterative nature in establishing individual ship allowances must be minimized. Redundancy, double-spending, and the duplication of efforts must also be held to a minimum.

Increased standardization in contracts would facilitate the decision to employ the supply system for repair parts. Standardization would result in parts being on the shelf for provisioned equipments. The supply system's responsiveness is the SHAPM's greatest concern. He must ultimately answer to SECNAV on the success or failure of his program.

A test of the supply system for DLA/GSA cognizance items proved satisfactory. Cost savings were achieved, the contractor concentrated on a smaller universe of hard to get material, and the system provided over 5,000 additional parts. This placed the burden on the supply system to produce results rather than the SHAPM and contractor.

The Navy supply system cannot support the last minute requirements of the outfitting community. After the loading COSAL, additional requirements provided in the AAP become time sensitive with regard to ship delivery. A combination

of administrative, procurement and production leadtimes require a change in established goals or an alternative source of supply.

Overall, maximizing Government Furnished Material (GFM) in new construction ships is a function of 1) the stage of design, 2) the sequence number of the ship in the class, 3) the degree of standardization, 4) the amount of non-standard provisioning completed, 5) the total number of ships in the class, 6) the stability of ship configuration, and 7) the Production Lead Time (PLT) and Procurement Lead Time (PCLT) for the repair parts.

B. RECOMMENDATIONS

The following recommendations for outfitting new construction ships have been developed as a result of the foregoing chapters.

1. Allowance Verification

It is recommended that each SHAPM establish internal controls to ensure that installed equipments are validated. Include in the program a measure to sample a match between verified equipment, the configuration data base in FOMIS/PECI, the WSF level A and the incremental or loading COSAL. The best parts procurement policies cannot increase the operational availability of a ship that maintains an inventory of wrong parts.

2. Equipment Standardization

In addition to maximizing Contractor Furnished Equipment (CFE), it is recommended that each contract invoke a clause requiring the use of standard equipment unless state of the art systems are designated for installation. This will reduce costs of technical documentation, provisioning and ordering costs associated with any non-standard piece of equipment.

Additionally, specify a timetable within the PTDSS for submitting non-standard PTD. The last minute submission of non-standard PTD must be eliminated wherever possible.

3. Allowance Subjectivity

The As Required (AR) allowance category introduces too much flexibility and uncertainty into the outfitting equation. It is recommended that NAVSEALOGSUPENGACT, Mechanicsburg PA, set firm allowances, establish maximum allowance ceilings, or detail allowances tied to a specific percentage of the crew for all AR items on AEL's. In many cases it is noted that individual "wants" rather than "needs" are satisfied. These excess resources should be utilized elsewhere.

In many cases pre-commissioning crews procure GUCL and 1I cognizance material prior to ship delivery. This results in the duplication of procurement. Allowance list material provided at ship delivery becomes excess. It is recommended that the Fitting Out and Supply Support Center

develop an approach to divide the current GUCL allowance lists into 1) a list of material required for pre-commissioning use, and 2) re-establish the GUGL requirements for post delivery consumption. In this manner, the SHAFM's pre-commissioning funds can continue to support the crew, minimize GUCL and form excesses, while protecting valuable resources.

4. Material Procurement

It is recommended that the supply system provide all outfitting material (CFM/GFM) except for Navy unique 1H/7cog material in the loading COSAL and AAF allowances. These should be broken-out on a Navy-wide, multi-year, winner-take-all competitive contract.

Centralizing the outfitting process in this manner has the advantages of higher volume buys while increasing the utilization of the supply systems professional talent. With time a critical factor once SPCC publishes the loading COSAL, an outside contractor can provide the support necessary to meet current goals for material availability at ship delivery. This recommendation requires certain considerations prior to full implementation:

* This process is not appropriate for lead ships or those follow-ships which deliver relatively close to the lead ship. Neither provisioning nor parts inventories have progressed far enough to allow requisitioning.

* Review the stage of design, configuration stability, provisioning status, degree of standardization, acquisition strategy, and the number of ships in the class.

* A change in the ISNSL report process to enable break-out of Navy unique allowances in the loading COSAL.

* Liaison with DLA/GSA headquarters to prevent unprepared draw-down of stock for outfitting ships. Planned requirements can be provided to these agencies in the form of Supply Support Requests (SSR's).

* The contractor must prove his ability to provide technical research and the sourcing of material requirements. Most important, he must be capable of providing parts to the fitting out site in a timely fashion.

APPENDIX A

ACRONYMS

TERM/ACRONYM	DEFINITION
AAP	Allowance Appendix Page/Package
ACO	Administrative Contracting Officer
ADAL	Authorized Dental Allowance List
AEL	Allowance Equipage List
AFC	Allowance Factor Code
AMAL	Authorized Medical Allowance List
APL	Allowance Parts List
ASO	Aviation Supply Office
BOSS	Buy Our Spares Smart
BRF	Best Replacement Factor
CDRL	Contractural Deliverable Requirements List
CF	Contractor Furnished
CFE	Contractor Furnished Equipment
CFM	Contractor Furnished Material
CICA	Competition in Contracting Act
CNO	Chief of Naval Operations
COG	Cognizance Symbol
COMTAC	Communications Tactical
COSAL	Coordinated Shipboard Allowance List

CRASP	COSAL Requisitioning and Status Procedures
CSA	Configuration Status Account
DLA	Defense Logistics Agency
DLR	Depot Level Repairable
ECP	Engineering Change Proposal
EDD	Estimated Delivery Date
FBM	Fleet Ballistic Missile
FLSIP	Fleet Logistic Suport Improvement Program
FMSO	Fleet Material Support Office
FOMIS	Fitting Out Management Information System
FOSSAC	Fitting Out and Supply Support Assistance Center
GFE	Government Furnished Equipment
GFM	Government Furnished Material
GSA	General Services Administration
GUCL	General Use Consumable List
HM&E	Hull, Mechanical and Electrical
HSC	Hardware System Command
IAD	Integrated Allowanace Document
I/COSAL	Integrated Coordinated Shipboard Allowance List
ICP	Inventory Control Point
ILS	Integrated Logistic Support
IM	Item Manager
IOL	Initial Outfitting List

ISNSL	Incremental Stock Number Sequence List
LORA	Level of Repair Analysis
LSA	Logistics Support Analysis
MAMS	Maintenance Assistance Modules
MCO	Maintenance Criticality Oriented
NAVMEDMATSUPPCOM	Naval Medical Material Support Command
NAVSEA	Naval Sea Systems Command
NAVSEALOGSUPENGACT	Naval Sea Systems Command Logistics Support Engineering Activity, Mechanicsburg
NAVSUP	Naval Supply Systems Command
NHA	Next Higher Assembly
NLA	Next Lower Assembly
NICN	Navy Item Control Number
NPFC	Naval Publications and Forms Center
NSA	Naval Supervising Activity
NSC	Naval Supply Center
NSF	Navy Stock Fund
NSN	National Stock Number
NP	New Procurement
OBRP	On Board Repair Part
OSA	Outfit Supply Activity
OSI	Operating Space Item
OTNP	Other Than New Procurement
PALT	Procurement Administrative Lead Time

PARM	Participating Manager
PCLT	Procurement Leadtime
PECI	Preliminary Equipment Component Index
PM	Program Manager
PPR	Planned Program Requirement
PR	Procurement Request
PRS	Provisioning Requirements Statement
PSICP	Program Support ICP
PTD	Provisioning Technical Documentation
PTDSS	Provisioning Technical Documentation Submission Schedule
RDD	Required Delivery Date
RFQ	Request For Quotation
SCN	Shipbuilding and Conversion, Navy
SECAS	Ship Equipment Configuration Accounting System
SHAPM	Ships Acquisition Project Manager
SHIPALT	Ship Alteration
SKED A	Schedule A (A list of GFM for a construction/conversion contract)
SLEP	Ship Life Extension Program
SM&R	Source, Maintenance and Recoverability Code
SPCC	Navy Ships Parts Control Center
SPD	Ship Project Directive
SPETERL	Ship's Portable Electrical/Electronic Test Equipment Requirements List

SPS	Statement of Prior Submission
SRI	Storeroom Items (OBRP)
SUPSHIP	Supervisor of Shipbuilding, Conversion and Repair, USN
TOR	Technical Override
UIC	Unit Identification Code
VLS	Vertical Launch System
WSF	Weapons System File

APPENDIX B

THESIS MASTER DATA

SHIP TYPE	COSAL LINE ITEM	COSAL DOLLARS	GUCL LINE ITEM	GUCL DOLLARS	TYPE III DOLLARS
ARS-51	7217	2,587,481	1787	100,581	63,623
ARS-52	8640	2,676,336	1787	96,435	61,000
CG-49	22598	22,918,608	2846	271,699	27,660,035
CG-50	22835	23,667,194	2673	246,753	27,660,035
FFG-53	19124	8,848,604	2893	196,433	1,313,461
FFG-55	19225	10,024,468	2892	200,018	653,809
FFG-56	20080	9,558,197	2899	191,564	730,165
FFG-58	20117	9,046,566	2845	181,736	700,062
LSD-42	14684	8,653,422	3272	381,129	53,900
SSBN-731	15670	13,115,991	597	136,168	57,365
SSBN-732	15253	11,816,081	594	139,045	57,365
SSN-718	10848	6,192,839	1196	62,825	75,000
SSN-719	10630	6,732,424	1198	73,777	1,687,425
SSN-720	11996	6,909,290	1198	78,101	1,687,425
SSN-721	10976	6,630,616	1080	73,430	1,617,858
CVN-71	34068	31,025,099	4605	2,701,495	3,221,967

SHIP TYPE	AMAL/ADAL LINE ITEM	AMAL/ADAL DOLLARS	OSA OBLIGATIONS EDD-3	EDD-2	EDD-1
ARS-51	787	32,034	0	0	14,222
ARS-52	787	30,713	23	100,668	20,699
CG-49	665	43,908	0	37,388	10,315
CG-50	665	43,908	0	0	500,713
FFG-53	665	32,298	0	181,797	0
FFG-55	665	32,298	0	4,326	3,077
FFG-56	665	32,298	41,845	153,610	299,574
FFG-58	665	30,966	297,444	47,144	147,801
LSD-42	1448	185,075	239,193	183,422	503,556
SSBN-731	463	21,527	537,765	271,833	179,194
SSBN-732	463	21,527	91,974	274,887	61,418
SSN-718	469	19,021	12,714	2,714	8,276
SSN-719	469	19,021	32,482	78,506	133,131
SSN-720	469	19,021	10,029	17,955	47,619
SSN-721	469	18,237	33,371	10,417	36,328
CVN-71	2369	619,549	670,667	794,370	854,501

SHIP TYPE	AS REQD LINE ITEM	AS REQD DOLLARS	FORM LINE ITEM	FORM DOLLARS	GF AAP DOLLARS
ARS-51	246	74,107	230	2,203	575,736
ARS-52	246	74,107	230	2,203	827,000
CG-49	328	100,291	371	10,614	0
CG-50	328	100,291	371	10,614	0
FFG-53	333	125,738	495	5,240	671,692
FFG-55	333	125,738	495	5,240	673,778
FFG-56	333	125,738	495	5,240	859,432
FFG-58	333	125,738	495	5,240	422,000
LSD-42	212	130,483	337	6,885	734,000
SSBN-731	87	65,759	250	2,792	587,399
SSBN-732	87	65,759	250	2,792	587,399
SSN-718	123	71,127	299	5,501	311,857
SSN-719	123	71,127	299	5,501	176,267
SSN-720	123	71,127	299	5,501	1,248,471
SSN-721	123	71,127	299	5,501	613,000
CVN-71	432	135,891	423	34,376	1,301,000

SHIP TYPE	SHIP COMPLEMENT	TOTAL DOLLAR VALUE
ARS-51	87	3,449,987
ARS-52	87	3,889,184
CG-49	395	51,052,816
CG-50	395	52,229,472
FFG-53	200	11,375,263
FFG-55	200	11,722,752
FFG-56	200	11,997,663
FFG-58	200	11,004,697
LSD-42	356	11,071,065
SSBN-731	171	14,975,793
SSBN-732	171	13,118,247
SSN-718	142	6,761,874
SSN-719	142	9,009,661
SSN-720	142	10,094,539
SSN-721	142	9,109,885
CVN-71	3204	41,358,832

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